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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,365	04/29/2004	Steven Dana Wolff	145542NM (GEMS0241PA)	3364

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EXAMINER	
WEATHERBY, ELLSWORTH	
ART UNIT	**PAPER NUMBER**
3768	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/29/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/709,365	WOLFF ET AL.	
	Examiner	Art Unit	
	Ellsworth Weatherby	3768	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/23/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-3, 5, 7, 8-10, and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyazaki et al. (PGPub. No. 2003/0042905) in view of Jara (U.S. Patent No. 6,917,199).

Regarding claims 1-3, 5, 7, and 8-10, Miyazaki et al. '905 teaches a method of generating a magnetic resonance image comprising: subjecting a subject to a magnetic field (0002), said subject comprised of a first tissue, a second tissue, and a third tissue (0107); generating a first inversion radiofrequency pulse (0105); generating a first train of radiofrequency pulses, a first TI time and taking a first image after said first train of radiofrequency pulses (0105; 0106); generating a second inversion pulse (fig. 7); generating a second train of radiofrequency pulses at a second TI time, said second TI time greater than said first TI time; taking a second image after said second train of radiofrequency pulses (0105; 0106). Miyazaki et al. '905 also teaches that the second TI time is between 150 and 250 ms (0105). Miyazaki et al. '905 also teaches first,

second, and third tissues comprising infracted tissue, blood, and normal myocardium tissue (0107). Miyazaki et al. '905 also teaches images with improved differentiation between infracted tissue and normal myocardial tissue (0105; 0107). Here, the examiner has interpreted the limitation that the first image nullifies the infarcted tissue and the second image nullifies the normal myocardium tissue to be met because as is standard in iterative T1 mapping, the TI times are arranged such that the all tissues will be sequentially nullified according to their intrinsic T1 null time. Miyazaki et al. '905 also teaches a second inversion pulse that is generated immediately after taking the first image (0105; 0107; fig. 7).

Miyazaki et al. '905 does not expressly teach generating a resultant image by combining the first and second images. Miyazaki et al. '905 teaches optimizing the display of the three tissues based on their varying T1 null time over a segmented k-space acquisition (0105; 0107), however does not expressly teach that the first TI time is approximately coincident with a T1 null time of the first tissue. Miyazaki et al. '905 also does not expressly teach that the second TI time is approximately coincident with at T1 null time of the third tissue. Miyazaki et al. '905 also does not expressly teach that wherein: said first tissue comprises a first T1 null time; said second tissue comprises a second T1 null time; said third tissue comprises a third T1 null time; wherein said third T1 relaxation time is greater than said second T1 null time and said third T1 null time is greater than said first T1 null time. Miyazaki et al. '905 also does not teach that the second T1 null time is greater than the first T1 null time.

In the same field of endeavor, Jara '199 teaches combining images to obtain T1 values at each voxel in a patient's body (col. 4, lines 44-48). Jara '199 also teaches the use of various TI times that are chosen such that they are approximately coincident with a T1 null time of the various tissues (col. 18, lines 45-52). Jara '199 also teaches three tissues that are ordered by increasing T1 null time such that a third tissue T1 null time is greater than both first and second tissue T1 null times (col. 9, lines 48-58).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the method for generating magnetic images over incremental TI times of Miyazaki et al. '905 with the combination of source images to determine T1 null times as taught by Jara '199. The motivation to combine the two would have been in order to provide a single contrast enhanced image constituting increased differentiation between a plurality of tissue species.

Regarding claims 13-15, Miyazaki et al. '905 teaches a method of generating a magnetic resonance image comprising: subjecting a subject to a magnetic field, said subject comprised of a first tissue, a second tissue, and a third tissue (0107); generating a first pulse sequence at a first TI time (fig. 7; 0105); generating a first image after said first pulse sequence (0106); generating a second pulse sequence at a second TI time (fig. 7; 0105); generating a second image after said second pulse sequence (0106); Miyazaki et al. '905 also teaches first, second, and third tissues comprising infracted tissue, blood, and normal myocardium tissue (0107).

Miyazaki et al. '905 does not expressly teach two images each having their respective first tissue magnitude, second tissue magnitude, and third tissue magnitude. Miyazaki et al. '905 also does not teach combining images to form a positive resultant first tissue magnitude, said first image third tissue magnitude and said second image third tissue magnitude combining to form a negative resultant third tissue magnitude.

In the same field of endeavor, Jara '199 teaches two images, each having their own respective tissue magnitudes as a result of varying TI time (col. 4, lines 13-35). Jara '199 also teaches combining source images to form a resultant image (col. 4, lines 44-48). Here, the examiner has interpreted the limitations that the images combine to form a positive resultant first tissue magnitude, said first image third tissue magnitude and said second image third tissue magnitude combining to form a negative resultant image third tissue magnitude to be met. The method described by Jara '199 teaches comparing different tissue magnitudes at two different TI times (col. 4, lines 13-35; col. 15. lines 50-60). Therefore, using the Jara'199 method while imaging the same tissues would produce the claimed resultant image. Jara '199 also teaches a first TI time that is approximately coincident with a T1 null time of the a first tissue; and a second TI time that is approximately coincident with a T1 null time of the third tissue (col. 18, lines 45-52).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the method for generating magnetic images over incremental TI times of Miyazaki et al. '905 with the combination of source images to determine T1 null times as taught by Jara '199. The motivation to combine the two would have been in

order to provide a single contrast enhanced image constituting increased differentiation between a plurality of tissue species.

3. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyazaki et al. '905 in view of Jara '199 as applied to claim 1 above, and further in view of Berr et al. (U.S. Patent No. 6,271,665).

Miyazaki et al. '905 in view of Jara '199 teaches all the limitations of the claimed invention except for expressly teaching that the first TI time is less than 100ms.

In the same field of endeavor, Berr et al. '665 teaches a first TI time that is less than 100ms (col. 6, lines 56-60).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the modified invention of Miyazaki et al. '905 with the short first TI time as taught by Berr et al. '665. The motivation to combine would have been to segment tissues that have very short T1 null times for identification.

4. Claims 6,11, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyazaki et al. '905 in view of Jara '199 as applied to claim 1 above, and further in view of Prince (U.S. Patent No. 5,799,649).

Regarding claims 6 and 11, Miyazaki et al. '905 in view of Jara '199 teaches all the limitations of the claimed invention except for expressly teaching that a contrast agent is introduced prior to taking the first image. Miyazaki et al. '905 in view of Jara

'199 also does not teach that the concentration of the contrast agent is higher in the first tissue than either the second tissue or the third tissue.

Prince '649 teaches as prior art administering a contrast agent prior to imaging such that the concentration of the contrast agent is highest in the blood (col. 2, lines 1-25).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the modified invention of Miyazaki et al. '905 with the use of a contrast agent as taught by Prince '649. The motivation to combine would have been to allow measurement of the relaxation times of blood, as taught by Prince '649 (col. 2, lines 7-11).

Regarding claim 17, Miyazaki et al. '905 in view of Jara '199 teaches all the limitations of the claimed invention except for expressly teaching that a contrast agent is introduced prior to taking the first image.

Prince '649 teaches as prior art administering a contrast agent prior to imaging such that the concentration of the contrast agent is highest in the blood (col. 2, lines 1-25).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the modified invention of Miyazaki et al. '905 with the use of a contrast agent as taught by Prince '649. The motivation to combine would have been to allow measurement of the relaxation times of blood, as taught by Prince '649 (col. 2, lines 7-11).

5. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyazaki et al. '905 in view of Jara '199 as applied to claim 1 above, and further in view of Roberts et al. (U.S. Patent No. 5,417,214).

Miyazaki et al. '905 in view of Jara '199 teaches all the limitations of the claimed invention except for expressly teaching that combining the first and second images comprises subtracting the first image from the second image.

In the same field of endeavor, Roberts et al. '214 teaches as prior art combining first and second images by subtracting the first image from the second image (col. 3, lines 35-54).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the modified invention of Miyazaki et al. '905 with the subtraction method as taught by Roberts et al. '214. The motivation to combine would have been to suppress the background intensity from any of the three tissues in the resultant image, as taught by Roberts et al. '214 (col. 3, lines 35-54).

6. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyazaki et al. '905 in view of Jara '199 and further in view of Prince '649.

Regarding claims 18-20, Miyazaki et al. '905 teaches a magnetic resonance imaging assembly for imaging a subject comprised of a first tissue, a second tissue, and a third tissue, the magnetic resonance imaging assembly comprising: a controller

comprising logic adapted to: generate a first inversion pulse (0105); generate a first train of gradient-recalled echo radiofrequency pulses at a first TI time and generate a first image after said first train of radiofrequency pulses (0046; 0105; 0106); generate a second inversion pulse (fig. 7; 0105); generate a second train of radiofrequency pulses at a second TI time, said second TI time greater than said first TI time (fig. 7; 0105); generate a second image after said second train of radiofrequency pulses (0106). Miyazaki et al. '905 also teaches an image acquisition segment segmented in k-space and ECG-gated to freeze cardiac motion (0083; fig. 7). Miyazaki et al. '905 also teaches an image acquisition segment comprising a train of RF pulses (fig. 7; 0105). Miyazaki et al. '905 further teaches an image acquisition segment comprising steady-state free-precession sequences (0018).

Miyazaki et al. '905 does not teach the use of gradient-recalled echo imaging. Miyazaki et al. '905 also does not teach generating a resultant image by digitally combining the first image and the second image.

In the same field of endeavor, Jara '199 teaches digitally combining source images to form a resultant image (col. 10, lines 47-57; col. 11, lines 1-13). Jara '199 also teaches the use of various TI times that are chosen such that they are approximately coincident with a T1 null time of the various tissues (col. 18, lines 45-52).

Jara '199 does not expressly teach the use of gradient recalled echo imaging.

Prince '649 teaches the use gradient recalled pulse sequences in T1 imaging (col. 12, lines 64-67; col. 13, lines 1-12).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the method for generating magnetic images over incremental TI times of Miyazaki et al. '905 with the combination of source images to determine T1 relaxation times as taught by Jara '199 and the use of gradient recalled pulse sequences in T1 imaging as taught by Prince '649. The motivation to combine would have been to maximize the data conveyed per image while using gradient recalled pulse sequences to reduce data acquisition time, as taught by Prince '649 (col. 12, lines 64-67; col. 13, lines 1-12).

7. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyazaki et al. '905 in view of Jara '199 and Prince '649 as applied to claim 18 above, and further in view of Roberts '214.

Miyazaki et al. '905 in view of Jara '199 and Prince '649 teaches all the limitations of the claimed invention except for expressly teaching that the resultant image is generated by subtracting a first image from a second image.

In the same field of endeavor, Roberts et al. '214 teaches as prior art combining first and second images by subtracting the first image from the second image (col. 3, lines 35-54).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the modified invention of Miyazaki et al. '905 with the subtraction method as taught by Roberts et al. '214. The motivation to combine would

have been to suppress the background intensity from any of the three tissues in the resultant image, as taught by Roberts et al. '214 (col. 3, lines 35-54).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ellsworth Weatherby whose telephone number is (571) 272-2248. The examiner can normally be reached on M-F 8:30 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eleni Mantis-Mercader can be reached on (571) 272-4740. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

EW

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SUPERVISORY PATENT EXAMINER